Investigating the Alignment of High School and Community College Assessments in California

By

Richard S. Brown & David N. Niemi

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Foreword

The National Center for Public Policy and Higher Education undertook a study to determine the de facto standards, or the knowledge and skills required to successfully enroll in college-level classes at California community colleges. While California community colleges are open to all students eligible and able to benefit, most students must demonstrate that they are ready for college-level academic work by passing the college's placement exam once they enroll. Because California does not explicitly define college readiness standards for high school students, the placement exams function as the de facto entry-level standards for higher education. The community colleges have academic standards; high schools, teachers, students, and parents have just not been clearly informed of them.

Based on their performance on the placement tests, the vast majority of students enrolling in a community college need remedial coursework in math and nearly half of them need it in English.

Over 94 different placement assessments were given to entering students last year at the community colleges. This study identifies the standards represented by the myriad placement tests in English language arts and mathematics. It then compares these standards to what high school students are expected to know in the 11th grade in order to determine if what we are expecting in high school matches what students need to know to take credit-bearing courses at the community college. This issue is critical for high school students, since the vast majority of students pursuing higher education in California will begin at a community college. It is also critical for California, since the future workforce depends upon the success of community colleges in educating these students.

The importance of this issue is reinforced by a recent national report by Achieve, Inc., *Aligned Expectations? A Closer Look at College Admissions and Placement Tests*, which concludes that the alignment of high school coursework and assessments with those in higher education is a necessary step in preparing more students to successfully enroll in and complete certificate and degree programs. In fact, the findings of the Brown and Niemi study described in this report and the subsequent recommendations by the National Center for Public Policy and Higher Education point to the

importance of linking higher education placement exams to high standards and assessments of high school students in math and English language arts.

The National Center is indebted to Richard Brown and David Niemi for their leadership and analysis of this important issue. We are also grateful to our lead advisors on this project: Michael Kirst, senior fellow at the National Center and professor of education at Stanford University, and Peter Ewell, vice president at the National Center for Higher Education Management Systems. The National Center is also grateful to the College Board and ACT who shared their test blueprints with the National Center for this analysis. We are also grateful to the California Community Colleges Chancellor's Office and to the California Department of Education for information made available to complete this analysis.

Also contributing their insight into our analysis was a national advisory group made up of the following: chair of the advisory group, Michael Usdan, senior fellow, National Center for Public Policy and Higher Education and senior fellow at the Institute for Educational Leadership; Steve Bruckman, executive vice chancellor, California Community Colleges; Andrea Conklin Bueschel, research scholar, The Carnegie Foundation for the Advancement of Teaching; Pamela Burdman, program officer, Education, The William and Flora Hewlett Foundation; Peter T. Ewell, vice president, National Center for Higher Education Management Systems; Marlene L. Garcia, vice chancellor of governmental relations and external affairs division, California Community Colleges; Robert H. McCabe, senior fellow, League for Innovation in the Community College; Brad Phillips, executive director, Cal-PASS; Anna Rothman, fellow, Senate Office of Research, California Legislature; Nancy Shapiro, associate vice chancellor, University System of Maryland; Nancy Shulock, executive director, Institute for Higher Education Leadership and Policy, California State University, Sacramento; and Abdi Soltani, executive director, Campaign for College Opportunity.

And contributing from the National Center for Public Policy and Higher Education were Jonathan Felder, policy analyst; Valerie Lucas, assistant to the vice president; and Mikyung Ryu, senior policy analyst.

Many community college leaders also assisted Brown and Niemi in their evaluation of the placement exams. They include: Daniel Bahner, title V activity director/student interventions, Crafton Hills College; Kirk Gorrie, associate faculty member, Irvine Valley College; Valerie Henry, lecturer,

University of California, Irvine; Keith Howard, assistant professor, Rossier School of Education, University of Southern California; Mickey Jackson, professor emeritus, Golden West Community College; Micah Jendian, English instructor, Grossmont College; Leanne Maunu, associate professor, Palomar College; Tim Thayer, math teacher, Mira Loma High School/San Juan Unified School District; and Julio Villarreal, former instructor, San Diego City College.

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Patrick M. Callan	*Joni E. Finney*
President	*Vice President*

Introduction

The California Community College system is the largest system of higher education in the world. Its 72 districts and 109 campuses served more than 2.5 million students in the 2005–2006 academic year. According to the California Community Colleges Chancellor's Web site (www.cccco.edu), the "…primary missions of the Colleges are to offer academic and vocational education at the lower division level for both recent high school graduates and those returning to school. Another primary mission is to advance California's economic growth and global competitiveness through education, training, and services that contribute to continuous workforce improvement." In addition, the Strategic Plan for the California Community Colleges lists the missions of the community college system as transfer education, basic skills and English language proficiency instruction, economic and workforce development, lifelong learning, and providing associate's degrees and certificates (California Community Colleges, 2006). The Strategic Plan also lists several strategic goals for the community college system. These include: increase college awareness and access; promote student success and readiness; strengthen partnerships for economic and workforce development; improve system effectiveness; and provide enhanced resources. This study focuses on only one aspect of these multiple objectives and that is the goal of promoting student success and readiness by evaluating the system of evaluating and placing students into community college courses.

As a result of the open access policy in place at community colleges in California, not all of the students who enroll are prepared for the academic rigors of college-level work. A recent study from the Institute for Higher Education Leadership & Policy concludes that the open access policies of California's community colleges have succeeded in enhancing enrollments, but have had the unintended consequence of inhibiting college completion (Shulock & Moore, 2007). They argue that since only one in four degree-seeking community college students actually earns a certificate or degree, transfers to a four-year university, or achieves some combination of those outcomes within six years of enrolling in a community college, policies should be changed to encourage better educational outcomes rather than simply focusing on allowing students to enroll.

Additional data offer further support to the argument that many students

enrolling from high school into community colleges in California are unprepared for college-level coursework. For example, the strategic planning research report entitled, *Environmental Scan: A Summary of Key Issues Facing California Community Colleges Pertinent to the Strategic Planning Proc*ess stated, "A recent survey of California community college placement test results indicated that only about 9% of students place in transfer level math and about 27% of students place in transfer level English…over 70% of students place in remedial math and 42% place in remedial English" (Research and Planning Group for California Community Colleges, 2005, p. 6). This means that the vast majority of students are initially placed in courses for which they will not receive credit at a California State University or University of California campus if and when they choose to transfer.

Having such large numbers of students take remedial courses is not without consequence. Students who start out in the remedial levels of math and reading courses have limited probability of attempting transfer level courses at the community college. The likelihood of attempting a transfer level English course after beginning in a reading fundamentals course at the community college is only 25% (Research and Planning Group for California Community Colleges, 2005). The numbers are more dismal for mathematics. The likelihood of taking a transfer level math course after starting in a basic level math course is only 10%. The Research Group report says, "Empirical evidence suggests that those who begin at the lowest levels of basic skills are unlikely to achieve a degree or transfer to a university" (p. 6). Given this evidence, there is reason to be concerned about the fact that one in every three students in the community colleges enrolls in a basic skills class.

Placement Testing in California Community Colleges

It is clear that many students entering the community college campuses are not prepared for college-level coursework. As data in the table on page 3 show, for students enrolled in 2005–2006 at California community colleges, of the more than one million students between the ages of 18 and 24 enrolled in credit-bearing courses, over 800,000 were directed to placement testing services during their time at the community college campus, of which 475,000 actually participated in placement testing. Another 340,000 students were directed to placement testing but did not take a placement test.

Determining which of the thousands of students at a given campus need

remediation is a difficult and challenging task. This task is not undertaken consistently across the state. While some campuses exempt students from placement testing based on previous collegiate coursework or Advanced Placement test scores from high school, there is no uniform placement testing process throughout the community college system. Each of the 109 community college campuses determines for itself which placement examinations to use and what the proficiency cut-scores will be for each test and placement decision. This flexibility in placement testing practices is not limited to California. According to a report on state policies regarding placement testing across the country, only "a small number of states have established minimum passing scores for entry into general education without referral to developmental education; more often such decisions are left to institutional discretion" (Prince, 2005, p. 3).

Table 1.

Flow of Use of Community College Placement Services

Placement Assessment Services	Number of Students
Enrolled in Credit-Bearing Courses	1,050,000
Exempted from Placement Testing	235,000
Directed to Placement Testing	815,000
Did Not Receive Placement Testing	340,000
Received Placement Testing	475,000

NOTE: This table represents assessment services for placement provided to students aged 18–24 enrolled for Annual 2005–2006. These services may have been provided at any time during their academic career up to and including Annual 2005–2006. Data provided by the California Community Colleges Chancellor's Office Web site (www.cccco.edu).

As a result of this varied approach to placement testing, nearly 100 different examinations are used for placement purposes across the state. The Chancellor's Office official Web site reports 94 assessments that were administered to students who were enrolled in the 2005–2006 academic year and more are on the list of assessments approved by the Chancellor's Office for use as placement instruments. This reflects the tremendous variability of placement testing practices. Three dozen second-party assessments gained approval, while more than one hundred other approved tests are listed as "locally developed and locally managed assessment instruments." Such variety yields inconsistency throughout the community college system not only in test content but also in levels of expected proficiency within a given subject area domain. Thus, it is unsurprising that students leaving high school for the community college campus are unaware of what it takes to be deemed adequately prepared for college-level coursework.

Placement testing volume in California community colleges is extensive. The volume of testing is inconsistent across assessments, however. Several placement exams were given to over 100,000 students, while others were presented to only a handful of students. Some of the assessments are commercially developed with extensive documentation to evaluate

their psychometric characteristics (although validation for community college placements is not always included). The most commonly used assessments are commercially developed and marketed assessments such as the ACCUPLACER CPTs by the College Board and the COMPASS tests developed by ACT. These two test batteries account for more than half of all placement testing in California community colleges. Other tests in widespread use include the Math Diagnostic Testing Program (MDTP), which was originally developed by faculty from the UC and CSU systems (current test development activities also include faculty from the community colleges), and the California Test for English Placement (CTEP), which was developed by California community college faculty.

Other placement exams in use across the community college campuses are locally developed and lack the requisite documentation to fully gauge the quality of the instruments, making judgments about their utility speculative. In some instances, such as at American River College in Sacramento, the community colleges deploy a self-placement approach wherein students are provided access to instruments to assess themselves and make course placement decisions based on those assessments. According to the American River College institutional research office, in these self-placement scenarios, validation of the self-placement assessment is not required under existing regulations. One thing is certain: the process for placement testing in California community colleges is inconsistent across campuses and student groups. What is tested and what constitutes proficiency or preparedness for college-level, credit-bearing courses varies dramatically across the system.

In addition to testing for proficiency in mathematics and English language arts (ELA), community colleges use different English as Second Language (ESL) placement exams for the placement of English learners into various ESL courses. Recent research funded by the University of California All Campus Consortium on Research for Diversity (UC/ACCORD) indicates that campuses vary widely in how they use ESL placement exams relative to regular English placement exams (Bunch, 2006). In research conducted with 15 community colleges, Bunch found that how campuses determine whether to advise students to take the ESL placement or the regular English placement varies across campuses using determinants, such as "self-evident" descriptors like "students for whom English is a second language," or comparisons with other languages, like "students whose strongest language is not English." He notes that, for the 15 campuses he studied, the criteria for determining

whether a student should take an ESL placement or a regular English placement test did *not* explicitly include scores from either the California English Language Development Test (CELDT), which is a test of English proficiency given in high schools, high school language designations, or scores from any other mandated high school assessment.

Bunch also found that while the systemwide policy clearly states that students can choose whether to take an ESL placement test or a regular English placement test, the campuses themselves do not make clear that students have this choice. Rather, they provide guidance as to who should take ESL tests or the regular English placements based on varied criteria. Given that the choice between these two types of placement tests determines which path toward credit-bearing English courses the student undertakes, the choice is important. Students take either the ESL placement or the regular English placement, but not both. Those taking the ESL placement are placed in one of several noncredit-bearing ESL courses. Those students taking a regular English placement exam may be referred to take the ESL placement test, but are generally placed in either a remedial (non-ESL) English course or nonremedial (non-ESL) English course. Taking the ESL placement can severely delay access to credit-bearing English courses. As Bunch accurately points out, because many language minority students are already at risk of dropping out, this initial determination of which placement test they take may well impact their college persistence and completion.

Efficacy of Placement Testing

With so much placement testing in the California Community College System, it is reasonable to ask whether such testing and placement are having a positive impact on student learning and student progression through college. The research on the efficacy of placement testing is mixed. In a review of research on the predictive validity of placement tests, Armstrong (1999) found that most of the studies relating community college placement test scores to course grades resulted in small or modest relationships. Armstrong cites numerous studies and provides illustrative examples of instances at specific community colleges in California where the placement tests were related to course outcomes, although few predictive validity coefficients exceeded the 35 threshold recommended by the Chancellor's Office. Armstrong summarizes the literature by saying, "most of these studies have found the validity coefficients to be low to moderate" (p. 82). Armstrong argues that

other variables, such as the grade expected in the course or grade received in the student's most recent mathematics course, had approximately the same predictive validity as math placement test scores. Similar findings were noted in predicting performance in English courses. Armstrong further cites research that found low predictive validity coefficients for the ASSET writing test and ASSET reading test on predicting English composition grades.

In another study, Armstrong (1994) showed that variation in student course grades was primarily a function of instructor grading variability and not as much influenced by placement test results. He recommends that any analytic model trying to predict student course outcomes should include instructors as well as placement test scores in the model to account for the greatest amount of variation in student outcomes. Armstrong also points out that students identified through placement exams as "unprepared" or "ineligible" for credit-bearing courses, but nonetheless took the courses, actually performed relatively well in those courses for which they were deemed ineligible. He argues, "The repeated finding that ineligible students were generally 70%–80% as successful as eligible students suggests strongly that student access may be unfairly denied and that many students capable of success are not given the chance to try. Inaccurate referral to lower level courses increases the opportunity cost for the students, and misallocates the educational resources of the college" (p. 208–209).

Providing strong predictive validity evidence for placement exams is not easy, particularly since such studies typically yield low predictive validity coefficients. Yet according to matriculation policies, each community college campus is required to periodically provide validity evidence of whatever placement system they employ, resulting in much expended energy and resources at the campus level. The Research and Planning Group for California Community Colleges laments this requirement, noting, "Limited research time can be better spent working with faculty and support staff on strategies that relate to student success, student learning outcomes, and persistence rather than validating a plethora of tests for 109 colleges" (2004, p. 1).

In addition to providing predictive validity coefficients, another way of determining whether placement testing is effective is to look at the success rate of students placed into specific courses. Ideally, if students are properly placed into courses for which they are most suited, they should perform successfully in those courses. Success in a course can be measured as the proportion of students obtaining a grade of C or better or obtaining a CR

grade indicating that the student earns credit for the course. While the overall success rate in California community college courses is over 66%, there are extreme variations across ethnicity and course type. White and Asian students have the highest rate of success in community college courses at 71%, while the success rate for Hispanic students is just under the overall success rate at 61%. African-American community college students are less successful in community college courses, with an overall success rate of 54%. However, these rates are across all courses. When the rates are broken out by the type of course (e.g., Basic Skills, Non-Basic Skills, or Pre-Collegiate Basic Skills) differences in success across course type become apparent.

Table 2.

Rate of Success in Community College Courses, by Ethnicity

Ethnicity	Total Enrollments	Number of Successes	Success Rate (%)
African-American	293,609	159,324	54.26
American Indian/Alaskan Native	34,922	21,802	62.43
Asian	437,889	311,849	71.22
Filipino	136,129	91,416	67.15
Hispanic	1,016,061	623,565	61.37
Other Non-White	75,481	49,797	65.97
Pacific Islander	29,306	17,932	61.19
Unknown	245,525	168,042	68.44
White Non-Hispanic	1,329,594	946,476	71.19
Grand Total	**3,598,516**	**2,390,203**	**66.42**

NOTE: This table represents student success by ethnicity in all courses in spring 2006. Success is characterized by obtaining a grade of A, B, C, or CR. The denominator for the success equation is the number of enrollments with grade of A,B,C,D,F,CR,NC,W,I. Data provided by the California Community Colleges Chancellor's Office Web site (www.cccco.edu).

For Basic Skills and Pre-Collegiate Basic Skills courses (non-degree credit courses, commonly called "remedial"), the rates are much lower than the rate for Non-Basic Skills courses, as shown in subsequent tables. For white students, the success rate drops from 72% in Non-Basic Skills courses to only 58% and 62% for Basic Skills and Pre-Collegiate Basic Skills courses, respectively. Likewise, the rates for African-American and Hispanic students are lower in the remedial courses than in the nonremedial courses. The success rate for African-Americans is 40% in Basic Skills and 41% in Pre-Collegiate Basic Skills courses as opposed to 56% in Non-Basic Skills courses. The same pattern holds for Hispanics, where the rate for the Basic Skills courses is 38% compared to 62% for Non-Basic Skills courses. Interestingly, Hispanic students had better success in the Pre-Collegiate Basic Skills courses than they did in the Basic Skills courses, with a success rate of 54%.

Table 3.

Rate of Success in Non-Basic Skills Courses, by Ethnicity

Ethnicity	Total Enrollments	Number of Successes	Success Rate (%)
African-American	265,854	147,889	55.63
American Indian/Alaskan Native	32,689	20,633	63.12
Asian	397,509	288,567	72.59
Filipino	130,085	87,922	67.59
Hispanic	910,041	569,364	62.56
Other Non-White	70,993	47,267	66.58
Pacific Islander	27,582	17,108	62.03
Unknown	233,146	161,955	69.47
White Non-Hispanic	1,278,260	914,652	71.55

NOTE: This table represents student success by ethnicity and Basic Skills status in courses in spring 2006. Success is characterized by obtaining a grade of A, B, C, or CR. The denominator for the success equation is the number of enrollments with grade of A,B,C,D,F,CR,NC,W,I. Data provided by the California Community Colleges Chancellor's Office Web site (www.cccco.edu).

Table 4.

Rate of Success in Basic Skills Courses, by Ethnicity

Ethnicity	Total Enrollments	Number of Successes	Success Rate (%)
African-American	2,774	1,111	40.05
American Indian/Alaskan Native	354	202	57.06
Asian	8,914	1,895	21.26
Filipino	831	435	52.35
Hispanic	18,003	6,753	37.51
Other Non-White	474	229	48.31
Pacific Islander	196	77	39.29
Unknown	3,440	998	29.01
White Non-Hispanic	7,228	4,192	58.00

NOTE: This table represents student success by Ethnicity and Basic Skills status in courses in spring 2006. Success is characterized by obtaining a grade of A, B, C, or CR. The denominator for the success equation is the number of enrollments with grade of A,B,C,D,F,CR,NC,W,I. Data provided by the California Community Colleges Chancellor's Office Web site (www.cccco.edu).

Table 5.

Rate of Success in Pre-Collegiate Basic Skills Courses, by Ethnicity

Ethnicity	Total Enrollments	Number of Successes	Success Rate (%)
African-American	24,981	10,324	41.33
American Indian/Alaskan Native	1,879	967	51.46
Asian	31,466	21,387	67.97
Filipino	5,213	3,059	58.68
Hispanic	88,017	47,448	53.91
Other Non-White	4,014	2,301	57.32
Pacific Islander	1,528	747	48.89
Unknown	8,939	5,089	56.93
White Non-Hispanic	44,106	27,632	62.65

NOTE: This table represents student success by Ethnicity and Basic Skills status in courses in spring 2006. Success is characterized by obtaining a grade of A, B, C, or CR. The denominator for the success equation is the number of enrollments with grade of A,B,C,D,F,CR,NC,W,I). Data provided by the California Community College Chancellor's Office Web site (www.cccco.edu).

From these data on student success in Basic Skills and Pre-Collegiate Basic Skills courses, it is difficult to argue that students are placed into courses that are well matched to their ability or achievement levels. This is particularly true for African-American and Hispanic students, where the majority of students placed in Basic Skills courses do not achieve success in those courses. Moreover, conditions are not expected to improve any time soon. As the community college research group states, "With an increase in the number of students needing remediation, overall success rates may begin to decline unless there is a commensurate increase in support services and/or improved methods of basic skills education" (Research and Planning Group for California Community Colleges, 2005, p. 6).

In summary, the inconsistent and varied processes for placement testing across the California Community College system result in uneven effects and unnecessary burdens on the community college campuses. The evidence on the predictive validity, utility, or effectiveness of placement tests currently in use is not compelling, and the success rate of students in community college courses, particularly in Basic Skills courses, is not overwhelming. The research group advising community college Chancellor Mark Drummond summarized it this way:

> "…after 18 years' experience with the colleges' process and 18 years perspective on the outcomes, it is the belief of the RP Group that California's community college students are not well served by the current approach, the implementation

> of which has resulted in great inconsistency in measures, processes, and placement outcomes from college to college. Those inconsistencies, in turn, have created unnecessary barriers for students entering the community colleges and for students attempting to transfer within our system. The existence of 109 assessment processes has made it difficult, if not almost impossible, to consider aligning placement in community college basic skills courses with the exit standards of the secondary system" (Research and Planning Group for California Community Colleges, 2004, p. 1).

Disjuncture Between Secondary and Community College Education

Clearly, a disjuncture between the secondary and community college education systems in California exists. Much has been written about the poor transition for students between secondary and postsecondary educational systems in the United States (see for example, Conley, 2003a; Conley 2003b; Kirst & Bracco, 2004; Kirst & Venezia, 2004; Smith & Wertlieb, 2005; Venezia, Kirst, & Antonio, 2003). Some argue that the transition is affected by student expectations (Karp, Holmstrom & Gray, 1998; Smith & Wertlieb, 2005) and social concerns (Holmstrom, Karp, & Gray, 2002; Tan, 1996). Others point to more structural aspects, such as a lack of formal linkages between secondary and postsecondary systems in terms of governance structures (Conklin, 2005) and accountability, information, and data systems (Kirst & Bracco, 2004; Venezia, Kirst, & Antonio, 2003). The disconnection between high school and college is also reflected in academic subject matter content. In fact, the most recent *Quality Counts* report from *Education Week* indicates that only 11 states have aligned their state high school assessments with postsecondary education (*Education Week*, 2007). Brown and Conley (in press) reviewed the alignment of the test content from 60 high school state assessments in 20 states and the knowledge and skills needed for university success and found modest but uneven alignment. While this study investigated the alignment between high school test content and the necessary knowledge and skills for success at top research universities across the country, it did not address the preparation needed for success in entry-level courses at open access community colleges, nor did it include high school exams from California. To gain insight into the potential effect of subject matter discordance on why such large numbers of California high school graduates need remediation in math and reading once

they arrive at the community college campuses, this study of the alignment between the content of state mandated high school examinations and the content of placement tests used by the community colleges was undertaken.

Purpose of This Study

The purpose of this study is to investigate the degree of alignment between the content of an array of placement examinations used in community colleges and key California Standards Tests (CSTs) in use in California high schools. This effort is similar in many ways to much of the content alignment work that has taken place regarding specific test content and university-level content standards (see for example, Brown & Conley, in press; Conley, 2003a). It differs, however, in one important way. The placement assessments in this study are not being reviewed to determine their alignment with the knowledge and skills expected for future university success. Rather, these placement assessments are to be analyzed to determine their alignment with the specific content that students are expected to have already mastered in high school. More specifically, this study seeks to determine the degree of content alignment between the "de facto standards" needed for community college preparedness (as measured by a plethora of placement exams in use across the state) and the standards measured by the augmented CSTs in math and English language arts in high school.

It is important to note that this study is focused on content alignment of assessments used at the secondary and community college campuses, not on other issues that are also important for understanding the disjunction between these educational systems. Other factors such as establishing proficiency standards, communication between segments, inconsistency across campuses with respect to testing practices, the multiple pathways students undertake as they progress through community colleges, English proficiency development, and the self-monitoring of assessment systems, while important, are not the focus of this investigation.

Impara (2001) recently detailed several models for conducting content alignment studies, ranging from low to high levels of complexity. While studies of content alignment have been undertaken for many years, a focus on different models for conducting such studies is a more recent issue in educational research. A few of the alternative models in content alignment research warrant discussion. In a fairly uncomplicated form,

an alignment methodology may simply employ content experts to make ratings regarding the match between a test item's content and the content standards test specifications. Generally, rating scales are employed to evaluate the breadth of content coverage and/or the depth of content coverage (cognitive complexity). Frequently, the level of agreement among the raters is determined and presented along with the level of content match between the assessment and the content standards or test specification. A variation of this approach was utilized by Le, Hamilton, & Robyn (2000) in their alignment among secondary and postsecondary assessments in California. This approach is certainly viable for the current context; however, it is limited in the amount of information that it provides.

A more moderately complex approach is described by LaMarca, et al. (2000). This approach enhances the simpler model by broadening the focus to include not only content match and depth of coverage, but also balance of coverage, performance match, and accessibility. In this approach, accessibility refers to a broad enough range of item difficulties on the assessment to allow students of all achievement levels to demonstrate their level of knowledge. As such, assessments targeted to extremely high (e.g., advanced placement) or extremely low (e.g., minimum competency) levels of performance would provide less accessibility.

The most complex of the approaches described by Impara (2001), created by Webb (1997, 1999), features multiple categories of criteria for judging alignment. Impara states, "because Webb's conceptualization of alignment is comprehensive and extends far beyond the two previously described models, it can be adapted for use in virtually any context" (p. 4). As a result, this approach, with a few modifications, is the procedure selected for aligning community college placement exams with the California high school assessments.

Methodology

This study is comprised of two distinct phases. In the first phase, placement exams in widespread use across the California Community College System were identified for inclusion in the study. These assessments were then subjected to a content analysis methodology to reduce this collection of test elements to a "corpus" of community college placement objectives. This approach was taken because there are a vast variety of placement tests used

in community colleges across the state and by looking at the most prevalent ones used and the material they cover collectively, we get a better picture of the diverse expectations students face upon entering the community college system.

The second phase of this project utilized data from the content analysis phase in an alignment rating workshop in which subject matter experts made judgments about the degree of alignment between the corpus of community college placement objectives (CCC objectives) and elements addressed by the augmented California Standards Tests (CST elements) given in California high schools. The augmented CST tests used in this study included the Algebra II and Summative High School Math test in mathematics, and the Grade 11 test in English language arts, which are part of the Early Assessment Program (EAP) which is a program developed by the California Department of Education, State Board of Education, and the California State University (CSU) system "designed to determine students' readiness to do college-level work in English language arts and/or mathematics while they are in their junior year of high school, and to align the CSU placement standards with the K–12 standards in English language arts and mathematics" (Early Assessment Program Frequently Asked Questions, 2006). These tests were chosen for inclusion in this study because they reflect the subject matter material students are expected to master in the latter years of high school (i.e., California standards for 11th grade) as well as material deemed important for placement decisions at campuses within the California State University system. Each of the mathematics exams are course specific, whereas the nonaugmented form of the English language arts test is given to all 11th grade students in California public high schools. Each phase of the project will be described in detail in the following paragraphs.

Phase I – Content Analysis of CCC Placement Exams

As mentioned, review of placement test usage at the community college campuses in California revealed a vast assortment of placement tests in use across the state. However, most of the placement testing was conducted with a small subset of placement exams (see Table 6). The most commonly used assessments were those that comprise the ACCUPLACER CPTs group of tests created by the College Board and the Compass battery of computer adaptive tests developed by American College Testing (ACT). In addition, in the area of mathematics, the Mathematics Diagnostic Testing Program

(MDTP) assessments developed by faculty from the University of California and California State University systems were widely used. Similarly, in English language arts, the California Test of English Placement (CTEP), which was developed by community college faculty, was frequently used on the community college campuses. From this group of tests, a total of 16 tests (7 in ELA, 9 in mathematics) were content analyzed. For the computer adaptive tests (various CTP/ACCUPLACER and ACT/COMPASS tests), it is not possible to evaluate specific test forms since the items presented to each student differ depending on the student's estimated ability level. Rather, the confidential test specifications and test blueprints for several tests were analyzed. These included three ACCUPLACER/CPT tests in math (Arithmetic, Elementary Algebra, College-Level Math), two in language arts (ACCUPLACER CPT Reading Comprehension and ACCUPLACER/CPT Sentence Skills) along with four ACT/COMPASS math tests (Numerical Skills/Pre-Algebra, Algebra, College Algebra, and Geometry) and two ACT/COMPASS tests in language arts (ACT/COMPASS Reading Comprehension and ACT/COMPASS Writing Skills). Access to the secured test details was obtained through written agreements between the test publishers and the National Center for Public Policy in Higher Education, for whom this report is prepared.

Table 6.

Approximate Number of Placement Tests Administered by Test Type Analyzed

Community College Placement Test	No. of Administrations
Mathematics	
CPT Arithmetic, Elementary Algebra, College-Level Math	200,865
MDTP Algebra Readiness and Elem. Algebra	102,779
ACT Compass Numerical Skills/Pre-Algebra, Algebra, College Algebra, Geometry	57,708
English Language Arts	
CPT Reading Comprehension, Sentence Skills	327,126
CTEP Sentence Structure and Grammar, Sentence and Syntax Skills	103,811
ACT Compass Reading Comprehension, Compass Writing Skills	90,162
CTEP Reading Comprehension	68,898

NOTE: Data provided by the California Community Colleges Chancellor's Office Web site regarding students enrolled during 2005–2006 academic year (www.cccco.edu).

For the MDTP and CTEP placement exams, actual test forms were analyzed. For the adaptive tests, content statements from the test specifications and blueprints were merged into our content summaries from actual test forms, as described below.

Phase 1 Content Analysis Participants

Three analysts evaluated the content of items for placement tests we were able to obtain from publishers. For some tests we could only obtain general blueprints, and we merged content statements from those documents into our content summaries, as described below. All content analysts had extensive previous experience in analyzing the content of curricula, standards, and tests and in conducting alignments of tests, curricula, and standards. Two analysts,

currently on the staff of the Center for Evaluation, Research, and Student Standards at UCLA, have doctorates in educational psychology; the third analyst has worked for many years as an alignment specialist for both the non-profit and commercial educational markets.

Training to do the analysis, conducted by the lead content analyst for the project, consisted of reviewing examples of items from the tests to be analyzed, discussing how the content of each item should be described, then individually evaluating the content of several sample items. To determine the right level of generality for describing content, we reviewed both California state high school standards and community college standards statements put together by Achieve. As an example of the level of generality used, the content description for a reading comprehension item typically included a statement about reading and understanding a certain piece of text, e.g., "Read and comprehend a one-paragraph informational text," in addition to a description of the particular response skill required by the item, e. g., "Choose the best title for a one-paragraph informational text."

For example, a reading comprehension item read as follows:

In line 26 (of the passage), impediment means

A. obstacle

B. asset

C. opportunity

D. defect

An analyst described the content of this item as follows:

- Read and understand grade-level material.
- Determine the meaning of a word in a written passage.
- Find a synonym for a word.

In some cases, we also described the skills necessary to identify incorrect answers; this happened, for example, when an item required identification of an incorrect or untrue statement. Another instance of items requiring students to recognize incorrect answers were the cloze (fill in the blank to complete a sentence) items used in language arts testing.

During the initial phase of training, after individual evaluation of a sample item, individual descriptions were compared and discussed, and a "correct" consensus evaluation determined. The basic steps of individual evaluation and group discussion of items were repeated until the analysts were able to agree on the content of several consecutive items. After training, the analysts divided up the tests to be analyzed and began their analysis. Reliability of the content analyses across analysts was then checked using procedures described in the next section.

Reliability Checks

To check the consistency of content analyses by different analysts, several items from each type of test were evaluated by two analysts and the results compared. For a given item, each descriptive content statement (or descriptor) for one analyst that closely resembled a descriptor generated by the other rater was counted as a match. A descriptor by either rater that did not closely resemble any descriptor by the other rater, was counted as a mismatch. We coded the following two statements, for example, as being in agreement:

> Analyst 1: Choose the best title for a one-paragraph informational text.
>
> Analyst 2: Determine the most suitable title for an informative paragraph.

We coded the following two statements, however, as a mismatch (because of the reference in the first statement to identification of information not in the paragraph):

> Analyst 3: Read a paragraph and determine specific information that is and is not in the paragraph.
>
> Analyst 2: Identify ideas presented in a passage and use them to answer a question related to the passage.

When conducting the reliability checks, several additional conventions were observed. First, if one analyst had combined two skills, such as, "Find the meaning of a word in a written passage and find a synonym," while another had split these into two separate skills, a separate agreement rating was assigned for each part—resulting in two instances of agreement in this example. In cases where one analyst described a more general skill, and another recorded that general skill in addition providing detailed descriptors of the skill that went beyond the level of generality originally agreed upon,

we counted the analysts' statements as matching on the general level. Because many items required multiple descriptors to capture their content, a single item could potentially involve several descriptor matches and/or mismatches.

To check reliability in math, 20 items were evaluated by two analysts, producing a 95% level of agreement between the analysts: Out of 43 possible descriptor matches for the 20 items, there were 41 matches and 2 mismatches. Given this high level of agreement, the remaining math items were analyzed by one person. In reading and language arts, 20 items (10 reading and 10 language arts) were also analyzed by two persons. Out of 48 possible descriptor matches for these items, there were 41 matches and 7 mismatches, for an overall agreement level of 85%. The remaining items were analyzed by one person. In many cases the mismatches found in reliability checks were a result of one rater neglecting to include for one or two items a general descriptor that occurred across a broad set of items (e.g., recognize correct sentences); this type of error of omission had no effect on the final content summary, since descriptors were not repeated in that summary.

Summarizing the Content

After the content of the various tests for each subject area (reading, language arts, and mathematics) had been analyzed, the content for each area was compiled into a single list. To accomplish this, we first generated category headings to capture the different types of content across tests in the subject area. Under each category heading we then assembled relevant content descriptors from each test, in addition to descriptors taken directly from the blueprints of tests for which we could not obtain items. The purpose of organizing content in this way was to simplify the task of matching content statements to those in the high school test documents; an alignment rater could look for content under headings such as "percents and decimals" or "punctuation," rather than having to scan through a long list of unordered content descriptors. After compiling descriptors, we eliminated redundant content (that is, content descriptors that used similar or identical language to capture the same skills or elements of knowledge) to arrive at the most concise list of content for each subject area.

Phase II – Alignment Rating Process

Alignment Workshop Participants

Community college and university faculty were recruited to serve as participants in the alignment rating workshop. All raters had experience with state high school assessments or direct involvement teaching entry-level community college courses. Training consisted of practice sessions in which training items were rated and discussed. From these training sessions, scoring criteria and decision rules were developed and refined by the researchers, then applied consistently during actual ratings. No fewer than four raters rated each test. The ratings for mathematics were conducted by a mixture of four community college and university faculty and the ratings for English language arts were conducted by a group consisting of five community college faculty from the southern California region.

Alignment Rating Activities

The alignment rating workshop involved three rating activities. The raters first reviewed and scored each of the CCC standards on a five-point scale adapted from Marzano (2001) to determine the depth of knowledge of each standard. The points of the scale were Retrieval, Comprehension, Analysis, Utilization, and Goal Setting/Monitoring. Marzano's scale is designed to reflect increasing cognitive complexity, more sophisticated uses of knowledge, and progressively higher levels of meta-cognitive functioning. The raters then used the five-point scale to assign a depth-of-knowledge rating to each augmented CST assessment element within a discipline.

The third rating task required raters to review each augmented CST element to determine whether it addressed one or more of the CCC objectives. Each augmented CST element was rated against each CCC standard and a determination was made as to whether that element addressed each CCC objective. In that way, an augmented CST element may be linked to any number of CCC objectives depending on its content coverage. The result of these three analyses was a matrix for each rater (CCC objectives by augmented CST assessment elements) that identified which augmented CST element addressed which CCC objective, how many CCC objectives within a content area were addressed by how many high school test elements, and which CCC objectives were not addressed by any augmented CST elements. That is, for each CCC content grouping, the number of augmented

CST assessment elements addressing it, as well as the number of objectives addressed by specific assessment elements could be identified. From these ratings, several alignment values are then calculated and compared to recommended criterion values from prior alignment research (Webb, 1997, 1999).

Alignment Criteria Values

This process of content focus alignment (Webb, 1997, 1999) yields scales to which criterion values are applied to reach overall conclusions about how well the corpus of CCC standards align with high school test content. The four alignment criteria analyzed were categorical concurrence (the number of matches between CCC objectives and augmented CST content), depth of knowledge (the cognitive complexity of test elements in relation to CCC objectives), range of knowledge (the spread of test content across CCC objectives), and balance of representation (the ways in which test elements that matched a CCC objective distributed onto CCC objectives within a CCC content area grouping).

Categorical Concurrence

Raters first determined categorical concurrence, the match between the CCC objectives and each element from the high school assessments. The goal is to determine two things: First, do the assessments cover areas deemed important to community college success as measured by placement exams; and, second, are the CCC objectives in their current format useful for determining such relationships? Raters were asked to identify which (if any) CCC objectives were addressed by each augmented CST element. These ratings were then summarized across raters to determine the average number of elements for each augmented CST assessment addressing one or more CCC objective. This criterion could range from 0 to the total number of elements included on the high school test. The recommended benchmark for this alignment criterion is that at least six items on average are aligned to each CCC grouping of objectives (Webb, 1999).

Depth of Knowledge Consistency

Recall that each augmented CST element and each CCC objective was given a depth of knowledge rating by each rater. Where categorical concurrence was established, the depth of knowledge raters between these components was compared. If the augmented CST element was rated at the same or

higher level of cognitive complexity as the CCC objective with which it corresponded, a relationship was noted. Keeping with Webb's methodology, for this analysis the depth of knowledge consistency is measured as the percentage of matches between augmented CST elements and a CCC objectives wherein the augmented CST element had an equivalent or higher depth of knowledge rating than the corresponding CCC objective. Values for this criterion range from 0 to 1.0, with a recommended benchmark greater than or equal to .50 (Webb, 1999). That is, for the augmented CST assessment to be considered adequately aligned to the community college objectives with respect to depth of knowledge, for at least half of the augmented CST to CCC matches the augmented CST component should be at or above the cognitive complexity level of the corresponding CCC objective.

Range of Knowledge

Range of knowledge was determined by tallying the number of CCC objectives that were addressed by one or more elements on the high school assessment. This criterion gives an estimate of the breadth of knowledge addressed by the high school tests. Webb describes the range-of-knowledge criterion as a means "to judge whether a comparable span of knowledge expected of students by a standard is the same as, or corresponds to, the span of knowledge that students need in order to correctly answer the assessment items/activities" (Webb, 1999, p. 8). This metric is created by calculating the percentage of objectives within a standard addressed by the assessment items for each rater. These rater estimates are then averaged across raters for a summary range of knowledge value. This criterion's value ranges from 0 to 1.0, with a recommended benchmark greater than or equal to .50. For the augmented CST tests to be considered adequately aligned to the CCC objectives with respect to range of knowledge, at least half of the objectives within a CCC grouping should be addressed. In this study, the number of objectives for a given grouping varied from 3 to 71 in ELA. The ELA content groups and the number of objectives in each are displayed in Table 7. These include: Sentence Structure, Grammar, Syntax, and Usage; Punctuation; Rhetorical Skills;

Table 7.

Number of CCC Objectives by Content Grouping

Community College Content Area	No. of Objectives
Language	
Sentence Structure, Grammar, Syntax, and Usage	71
Punctuation	19
Rhetorical Skills	3
Organization	5
Style	7
Reading	
Vocabulary and Sentence Relationships	4
Literal Comprehension	12
Main Ideas	4
Supporting Ideas	4
Inferences	19
Applications	3

Table 8.

Number of CCC Objectives by Content Grouping

Community College Content Area	No. of Objectives
Mathematics	
Whole Numbers and Fractions	20
Decimals and Percents	16
Applications and Interpreting Tables/Graphs	14
Integers and Rational Numbers	6
Algebraic Expressions and Operations	16
Operations with Exponents	8
Equations, Inequalities, and Word Problems	11
Functions	9
Trigonometry	8
Geometry	16
Graphing	16
Applications and Other Algebra Topics	15

Organization; and Style. In Reading, the content groupings include: Vocabulary and Sentence Relationships; Literal Comprehension; Main Ideas; Supporting Ideas; Inferences; and Applications. The number of objectives in the math content groupings ranged from six to 20 in the following content groupings: Whole Numbers and Fractions; Decimals and Percents; Applications and Interpreting Tables/Graphs; Integers and Rational Numbers; Algebraic Expressions and Operations; Operations with Exponents; Equations, Inequalities, and Word Problems; Functions; Trigonometry; Geometry; Graphing, Applications and Other Algebra Topics.

Balance of Representation

Balance of representation identified how those items that matched specific CCC objectives were distributed onto the CCC objectives they matched. This criterion indicates the extent assessment items are evenly distributed across objectives. Like the depth of knowledge and range of knowledge criteria, balance of representation is expressed via an index score from 0 to 1.0, but has a recommended benchmark of .70 rather than .50. This higher threshold is established to ensure that reasonably good overlap exists between the test elements and the CCC objectives overall.

Results

Reliability of Ratings

The depth of knowledge ratings for the CCC objectives and the augmented CST content elements obtained in the first two rating exercises were analyzed for rater agreement. These analyses utilized generalizability theory (Shavelson & Webb, 1991) to investigate the consistency of ratings. The generalizability coefficient (g-coefficient) is comparable to the more common reliability coefficient from classical test theory and indicates the percent of variability in the scores which are due to systematic influences. Relative g-

coefficients provide estimates of consistency of rank ordering elements by raters, whereas absolute g-coefficients provide estimates of consistency of the value of elements across raters. Estimated g-coefficients for the CCC ratings were found to be lower than the estimated g-coefficients for the ratings of augmented CST elements. However, in both cases, generalizability coefficients exceeded the minimally acceptable threshold of .70 and were often closer to or above the more desirable threshold of .80, even for the slightly more stringent absolute g-coefficients.

Table 9.

Reliability of Depth of Knowledge Ratings

Subject Area	Relative g-coefficient	Absolute g-coefficient
Mathematics		
CCC Objectives	.79	.79
Augmented CST Elements	.91	.90
ELA/Reading		
CCC Objectives	.73	.72
Augmented CST Elements	.81	.79

Categorical Concurrence

Ratings of categorical concurrence produced interesting results (see Tables 10 and 11 for summaries of alignment ratings for ELA and mathematics, respectively). In the area of English language arts, we found that the elements of the augmented CST Grade 11 ELA test was aligned quite well to all of the content groupings for the CCC placement exams, using Webb's criterion of having at least six items per grouping to establish sufficient coverage of the content. The augmented CST test had the strongest categorical concurrence in the area of sentence structure, grammar, syntax, and usage, primarily due

Table 10.

Summary of Alignment Ratings for English Language Arts

Community College Content Area	Categorical Concurrence[a]	Depth of Knowledge[b]	Range of Knowledge[c]	Balance of Representation[d]
Language				
Sentence Structure, Grammar, Syntax, and Usage	66.60*	83.55%*	86.20%*	0.92*
Punctuation	26.40*	59.73%*	100.00%*	0.99*
Rhetorical Skills	15.00*	49.39%	100.00%*	0.92*
Organization	16.60*	90.78%*	100.00%*	0.92*
Style	27.40*	83.14%*	100.00%*	0.93*
Reading				
Vocabulary and Sentence Relationships	13.80*	70.71%*	80.00%*	0.94*
Literal Comprehension	68.80*	93.46%*	91.67%*	0.82*
Main Ideas	14.60*	100.00%*	60.00%*	0.93*
Supporting Ideas	14.60*	87.23%*	100.00%*	0.97*
Inferences	107.00*	78.83%*	91.58%*	0.84*
Applications	14.80*	92.80%*	60.00%*	0.95*

NOTES:

[a]Criterion value for this measure is at least 6.0

[b, c]Criterion value for these measures is at least 50%

[d]Criterion value for this measure is at least 70%

*Indicates sufficient values to reflect acceptable alignment

to the fact that this CCC content grouping had substantially more elements (71) than did the other content groupings. However, even in CCC content groupings with a more modest number of elements, there was still substantial alignment. In the area of inferences, for example, there are but 19 elements in the content grouping, but there was an average of 107 matches between these 19 elements and the 28 standards comprising the augmented CST test.

The categorical concurrence results were not as strong in the area of mathematics as they were in ELA. Whereas every content grouping in ELA showed sufficient alignment on the categorical concurrence metric, the same can be said for less than half of the content groupings in mathematics. Specifically, the augmented CST tests showed sufficient categorical concurrence alignment in the areas of algebraic expressions and operations; equations, inequalities, and word problems; functions; geometry; and applications and other algebra topics. But they did not adequately align in the areas of whole numbers and fractions; decimals and percents; applications and interpreting tables/graphs; integers and rational numbers; operations with exponents; trigonometry; or graphing. Thus, it appears from a content standpoint, there are many more elements addressed by the placement tests used at the community colleges than students taking these two high school assessments are tested on. It may be that some of these topics like whole numbers and fractions or decimals and percents are covered in courses

Table 11.

Summary of Alignment Ratings for Mathematics

Community College Content Area	Categorical Concurrence[a]	Depth of Knowledge[b]	Range of Knowledge[c]	Balance of Representation[d]
Mathematics				
Whole Numbers and Fractions	0.00	N/A	0.00%	N/A
Decimals and Percents	0.00	N/A	0.00%	N/A
Applications and Interpreting Tables/Graphs	2.75	87.50%*	8.93%	0.96*
Integers and Rational Numbers	0.75	100.00%*	12.50%	1.00*
Algebraic Expressions and Operations	21.00*	100.00%*	71.88%*	0.85*
Operations with Exponents	1.75	100.00%*	18.75%	0.96*
Equations, Inequalities, and Word Problems	12.50*	89.58%*	59.09%*	0.84*
Functions	11.00*	79.57%*	58.33%*	0.78*
Trigonometry	3.75	100.00%*	43.75%	0.96*
Geometry	14.75*	87.75%*	67.19%*	0.90*
Graphing	4.25	100.00%*	25.00%	0.96*
Applications and Other Algebra Topics	6.50*	92.46%*	26.67%	0.83*

NOTES:
[a]Criterion value for this measure is at least 6.0
[b, c]Criterion value for these measures is at least 50%
[d]Criterion value for this measure is at least 70%
* Indicates sufficient values to reflect acceptable alignment

that precede the courses for which these end-of-course assessments are targeted. However, this does not explain the lack of concordance in areas like trigonometry or, perhaps, graphing and operations with exponents.

Depth of Knowledge Consistency

The depth of knowledge measure of alignment is useful for determining whether the elements on the augmented CST exams that are matched to objectives from the placement exams have a comparable (or higher) level of cognitive demand than do the objects to which they are matched. In the case of the English language arts, the augmented CST elements aligned well with the placement objectives in all but one content grouping. In rhetorical skills, the augmented CST elements were found to have an equal or higher level of cognitive demand than the placement objectives for 49.39% of the ratings, which is just slightly below the threshold of 50% Webb recommends for demonstrating sufficient depth of knowledge alignment. In all other content groupings, the values well exceeded this recommended benchmark, thereby demonstrating sufficient depth of knowledge alignment in most areas of language arts and reading. That is, the high school tests appear to be addressing the topics they share with the placement tests at a sufficient level of cognitive demand.

For mathematics, similar results were obtained. With the exception of the areas for which no depth of knowledge ratings could be calculated because no matches were obtained (i.e., whole numbers and fractions; decimals and percents), the high school test content showed sufficient depth of knowledge alignment with the community college placement exams. In many cases, all of the matches in a content grouping showed that the cognitive demand of the augmented CST elements met or exceeded the cognitive demand of the CCC placement test objectives. Thus, it appears the depth of knowledge measures indicate sufficient alignment between the augmented CST test content and the CCC placement tests in both ELA and mathematics.

Range of Knowledge

The ratings for range of knowledge differ from the ratings of categorical concurrence in that they show not how many matches between the augmented CST elements and the CCC objects were obtained, but how many of the objectives within a content grouping were matched to an augmented CST element. This gives a sense of how broadly covered the CCC placement

objects are by the augmented CST elements. In the case of ELA all of the content groupings showed sufficient range of knowledge alignment. That is, the majority of objectives within each CCC placement test content grouping was matched to at least one augmented CST element. Such was not the case with mathematics.

The math tests showed sufficient range of knowledge alignment in only four of the 12 CCC placement test content groupings. These included: algebraic expressions and operations; equations, inequalities, and word problems; functions; and geometry. The augmented CST tests did not show sufficient range of knowledge alignment in the areas of whole numbers and fractions; decimals and percents; applications and interpreting tables/graphs; integers and rational numbers; operations with exponents; trigonometry; graphing; or applications and other algebra topics. These results for range of knowledge alignment are consistent with the results for categorical concurrence in finding that many areas of mathematics that are addressed in the placement exams used by community colleges in California are not tested by these end-of-course high school assessments, resulting in weak alignment across the systems.

Balance of Representation

The results for the balance of representation alignment metric show that in the area of ELA, the augmented CST elements were adequately distributed across the objectives within each CCC placement test content grouping. None of the content groupings in either Language or Reading had a balance of representation value below the recommended threshold of .70. This suggests that the augmented CST elements did not cluster unexpectedly on a few of the objectives within a content grouping, but rather they were spread out across the objectives within each group. Thus, as with categorical concurrence, depth of knowledge consistency, and range of knowledge, it appears the high school test content in English language arts is adequately aligned with the content of placement exams used in California community colleges with respect to balance of representation.

Good balance of representation alignment between augmented CST test content and CCC placement objectives was also found in the area of mathematics. As was the case in ELA, all of the content groupings for CCC placement tests in mathematics matched to augmented CST content showed

balance of representation measures in excess of the .70 recommended threshold for demonstrating adequate alignment. This suggests that where matches between augmented CST content and CCC placement test content were observed within a content grouping, the matches were distributed across the objectives adequately rather than clustering on a limited number of objectives. Thus, the content of the augmented CST high school assessments shows good alignment to the community college placement tests with respect to balance of representation and depth of knowledge consistency, but falls short in some areas with respect to categorical concurrence and range of knowledge alignment.

Conclusions and Recommendations

The results of this alignment study suggest that the augmented CSTs in English language arts demonstrates sufficient alignment with the objectives measured by the most prevalent placement exams in use on California community college campuses. Results differed across subject areas. Whereas the ELA test showed strong alignment in all four areas across content groupings, the math tests showed adequate alignment values only with respect to depth of knowledge consistency and balance of representation, falling short in many content areas in terms of categorical concurrence and range of knowledge alignment. Some mathematics topics covered by the placement exams are simply not addressed by the augmented CST tests. These tended to be either lower-level mathematics concepts such as whole numbers or fractions, or they involved topics beyond the level of Algebra II, such as trigonometry. This may have resulted from the greater number and wider variety of placement exams evaluated in mathematics relative to English language arts.

It is also important to keep in mind that this study analyzed the alignment of content from two math tests (augmented versions of the Algebra II and Summative High School Math assessments) that are part of the Standardized Testing and Reporting system for California's secondary education, but are not the only tests for 11th grade students in mathematics. These are end-of-course exams that are taken only by students taking specific courses, unlike the Grade 11 CST in English language arts that is given to all students in the 11th grade.

In fact, these math tests are taken by relatively few high school students.

In 2006, of 1,731,267 students tested in high school mathematics, only 99,315 (5.7%) took the Summative High School Math Test and only 213,708 (12.3%) took the Algebra II assessment. Most of the students tested in high school math are tested on either the Algebra I test (706,416 or 40.8%), the Geometry Test (359,802 or 20.8%), or the General Mathematics test (338,766 or 19.6%). There is, however, considerable overlap in content between the Summative High School Math test and both the Algebra I test and the Geometry Test.

Not only do relatively few students take the Summative High School Mathematics Test and the Algebra II test each year, but those who take the test do not perform particularly well on it. According to recent data from the California Department of Education (CDE) Web site, less than half (46%) of the students taking the Summative High School Mathematics test performed at or above the proficient level in 2006, while about 28% performed at the Basic level, indicating that about a quarter of the students performed below the Basic level of achievement. Only about a quarter of students taking the Algebra II test achieve at or above Proficient, with another 27% scoring at the Basic level, suggesting that nearly half of all students taking the Algebra II test failed to score at least at the Basic level of achievement (see Table 12). So, while the test content of these two high school tests may be modestly aligned to some topics examined by community college placement exams, relatively few students are actually taking these tests and much fewer are mastering the material they cover. As a result, it is unsurprising to see a large proportion of students relegated to remedial mathematics courses once they arrive at the community college campuses.

Table 12.

Statewide Proficiency Rates for CST Tests 2006

CST Test	% Basic	% Proficient or Above
Mathematics		
Algebra II	27	25
Summative High School Math	28	46
English Language Arts		
Grade 11	24	36

NOTE: Data obtained from California Department of Education Web site www.cde.ca.gov.

The alignment between high school assessments and college placement exams is good in English language arts, however. So if the tests in ELA are well aligned across high school and community college systems, then why do so many students require remediation? While alignment between the Grade 11 ELA test in high school and the content of community college placement exams appears strong, the preparation of high school students in terms of mastering that content is seriously lacking. Only 36% of students taking the Grade 11 ELA test in 2006 reached the level of Proficient or better, with another 24% scoring at the Basic level, indicating about two-thirds of the students did not master the

material sufficiently to be deemed proficient and roughly 40% of students score at a level below Basic achievement. So, while high school students may be instructed in and tested on subject matter content that aligns well with the expectations at community colleges, alignment alone is insufficient to stem the rising need for remediation. These results suggest that alignment between high school tests and community college placement examinations may be a necessary but insufficient condition to adequately prepare students for the transition from secondary to postsecondary education.

One suggestion for improving the disjunction between high school and community college is to make clear to students early in their educational careers, perhaps as early as middle school, what is expected of them upon enrollment at the community colleges by developing continuity across the high school, community college, and four-year college systems. In much the same way as the University of California and California State University systems have prepared a list of course requirements for admission eligibility, community colleges could outline the expected levels of preparation for students to undertake college credit-bearing coursework and how that relates to the courses they need to take in high school. While creating such a set of criteria would require consistency across the community college campuses and would be a challenging undertaking, merely establishing such expectations is not enough. This information would then need to be communicated to students, parents, high school counselors, and high school district curriculum personnel on a consistent and ongoing basis.

One way of sending a uniform message and generating consistent expectations across community college campuses is to make common the placement testing practices the campuses employ. This might mean determining a limited set of existing assessments to be used, or developing a placement test battery specifically for the community colleges. Such a dramatic shift from existing practices would require involvement at the state level, with the Community College Board of Governors playing a major role in establishing a consistent and coherent placement testing policy. Additional research should be conducted into the alignment of the community college placement tests and other existing placements such as the English Placement Test and the Entry-Level Math Test in use at the other college systems in the state, as well as the alignment between placement tests and the skills actually addressed in the community college classrooms.

It is also advisable to bring leaders in K–12 education into the discussion. The State Board of Education and the Community College Board of Governors could work collaboratively to address the problem of aligning the systems from both perspectives. Such an effort could have a far-reaching impact. Much attention is paid to preparing students for the University of California and the California State University systems, either through focusing on A-G course requirements, encouraging Advanced Placement/ Honors course taking, or emphasizing SAT test performance. It is time we make a comparable effort to send clear signals, properly inform, and prepare those students who will enroll at the community college campuses, especially since they constitute the vast majority of college students in California.

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About the Authors

Richard S. Brown is an Assistant Professor in the USC Rossier School of Education. Prior to joining USC, he served as an Assistant Professor of Education and Director of the Center for Research in Educational Assessment and Measurement in the Department of Education, University of California, Irvine. He teaches courses in educational measurement, advanced statistics, and research methodology. Brown has a M.B.A. from the University of California, Irvine (1989) and Ph.D. in Advanced Quantitative Methods from the University of California, Los Angeles (1999). Previously, he worked as Senior Researcher at the National Center for Research on Evaluation, Standards, and Student Testing (CRESST) at UCLA. His work at CRESST involved providing technical expertise on two large-scale public school assessment initiatives, specifically in the areas of test development, measurement, and performance standard setting. He also conducted research on developing an indicator system for California public schools and exploring graphical representations of data to evaluate school performance, which has continued with his work at USC advising the Center for Educational Governance in developing indicators for measuring charter school performance. In addition, Brown frequently works with the California Department of Education, serving as a member of several technical advisory committees. In this capacity, Brown engages in discussions and provides feedback and advice to the CDE on technical issues, particularly in the areas of testing and assessment in the California public school system.

David N. Niemi is an Assistant Director at the Center for Research on Evaluation, Standards, and Student Testing at UCLA. He is also Vice President of Evaluation and Research at K12 Inc., where he oversees research to evaluate and improve educational programs and the development of new assessments. He has been a co-principal investigator for a number of large-scale assessment research projects funded by the U. S. Department of Education and the National Science Foundation. He has also managed assessment development and validation studies in school districts across the U. S, and has trained thousands of teachers and other professionals to use assessments more effectively. Previously he was a professor and chair of Educational Psychology at the University of Missouri, Columbia. His research focuses on the assessment and development of conceptual understanding across the curriculum, and he has published many book chapters, papers, and training manuals on this topic. His research is informed by extensive K–12 teaching and administrative experience, which includes teaching elementary school, high school English, and special education. He received his Ph.D. in Education from UCLA.

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Investigating the Alignment of High School and Community College Assessments in California, by Richard S. Brown and David N. Niemi (May 2007, #07-3). This study, in examining the math and English expectations for high school students entering California's community colleges, reveals the degree of alignment between what students master in high school versus what is expected for college-level work.

"Informed Self-Placement" at American River College: A Case Study, by Jonathan E. Felder, Joni E. Finney, and Michael W. Kirst (May 2007, #07-2) This case study of American River College in Sacramento, California, examines replacing the traditional mathematics class placement test with "informed self-placement."

California Community Colleges: Making Them Strong and More Affordable, by William Zumeta and Deborah Frankle (March 2007, #07-1). This report examines the effectiveness of statewide policies in assisting the California Community Colleges in meeting their mandate for affordability, and makes recommendations in light of today's public needs.

Measuring Up Internationally: Developing Skills and Knowledge for the Global Knowledge Economy, by Alan Wagner (September 2006, #06-7). In comparing the performance of the United States in higher education with that of advanced, market-economy countries across the globe, this report finds that the United States' leadership position has eroded.

Measuring Up 2006: The National Report Card on Higher Education (September 2006). *Measuring Up 2006* consists of a national report card for higher education (report #06-5) and 50 state report cards (#06-4). The purpose of *Measuring Up 2006* is to provide the public and policymakers with information to assess and improve postsecondary education in each state. For the first time, this edition offers international comparisons with states and the nation as a whole. Visit www.highereducation.org to download *Measuring Up 2006* or to make your own comparisons of state performance in higher education.

> ***Technical Guide for* Measuring Up 2006: *Documenting Methodology, Indicators, and Data Sources*** (2006, #06-6).

Checks and Balances at Work: The Restructuring of Virginia's Public Higher Education System, by Lara K. Couturier (June 2006, #06-3). This case study of Virginia's 2005 Restructured Higher Education Financial and Administrative Operations Act examines the restructured relationship between the commonwealth and its public colleges and universities. The act gives more autonomy to the public colleges but checks it with new accountability targeted directly to the needs of the state.

American Higher Education: How Does It Measure Up for the 21st Century? by James B. Hunt Jr. and Thomas J. Tierney with a foreword by Garrey Carruthers (May 2006, #06-2). These essays by former Governor James B. Hunt Jr. and business leader Thomas J. Tierney lay out in succinct fashion the requirements of both our nation and our states for new and higher levels of performance from America's colleges and universities.

Claiming Common Ground: State Policymaking for Improving College Readiness and Success, by Patrick M. Callan, Joni E. Finney, Michael W. Kirst, Michael D. Usdan, and

Andrea Venezia (March 2006, #06-1). To improve college readiness and success, states can develop policies that better connect their K–12 and postsecondary education systems. However, state action in each of the following policy areas is needed to create college-readiness reform: alignment of coursework and assessments; state finance; statewide data systems; and accountability.

Measuring Up on College-Level Learning, by Margaret A. Miller and Peter T. Ewell (October 2005, #05-8). In this report, the National Forum on College-Level Learning proposes a model for evaluating and comparing college-level learning on a state-by-state basis, including assessing educational capital. As well as releasing the results for five participating states, the authors also explore the implications of their findings in terms of performance gaps by race/ethnicity and educating future teachers.

The Governance Divide: A Report on a Four-State Study on Improving College Readiness and Success, by Andrea Venezia, Patrick M. Callan, Joni E. Finney, Michael W. Kirst, and Michael D. Usdan (September 2005, #05-3). This report, supported by case studies in Florida, Georgia, New York, and Oregon, identifies and examines policy options available to states that are interested in creating sustained K–16 reform.

> ***The Governance Divide: The Case Study for Florida***, by Andrea Venezia and Joni E. Finney (2006, #05-4).
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> ***The Governance Divide: The Case Study for Georgia***, by Andrea Venezia, Patrick M. Callan, Michael W. Kirst, and Michael D. Usdan (2006, #05-5).
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> ***The Governance Divide: The Case Study for Oregon***, by Andrea Venezia and Michael W. Kirst (2006, #05-7).

Borrowers Who Drop Out: A Neglected Aspect of the College Student Loan Trend, by Lawrence Gladieux and Laura Perna (May 2005, #05-2). This report examines the experiences of students who borrow to finance their educations, but do not complete their postsecondary programs. Using the latest comprehensive data, this report compares borrowers who drop out with other groups of students, and provides recommendations on policies and programs that would better prepare, support, and guide students—especially low-income students—in completing their degrees.

Case Study of Utah Higher Education, by Kathy Reeves Bracco and Mario Martinez (April 2005, #05-1). This report examines state policies and performance in the areas of enrollment and affordability. Compared with other states, Utah has been able to maintain a system of higher education that is more affordable for students, while enrollments have almost doubled over the past 20 years.

Measuring Up 2004: The National Report Card on Higher Education (September 2004). *Measuring Up 2004* consists of a national report card for higher education (report #04-5) and 50 state report cards (#04-4). The purpose of *Measuring Up 2004* is to provide the public and

policymakers with information to assess and improve postsecondary education in each state. For the first time, this edition provides information about each state's improvement over the past decade. Visit www.highereducation.org to download *Measuring Up 2004* or to make your own comparisons of state performance in higher education.

***Technical Guide Documenting Methodology, Indicators, and Data Sources for* Measuring Up 2004** (November 2004, #04-6).

Ensuring Access with Quality to California's Community Colleges, by Gerald C. Hayward, Dennis P. Jones, Aims C. McGuinness, Jr., and Allene Timar, with a postscript by Nancy Shulock (May 2004, #04-3). This report finds that enrollment growth pressures, fee increases, and recent budget cuts in the California Community Colleges are having significant detrimental effects on student access and program quality. The report also provides recommendations for creating improvements that build from the state policy context and from existing promising practices within the community colleges.

Public Attitudes on Higher Education: A Trend Analysis, 1993 to 2003, by John Immerwahr (February 2004, #04-2). This public opinion survey, prepared by Public Agenda for the National Center, reveals that public attitudes about the importance of higher education have remained stable during the recent economic downturn. The survey also finds that there are some growing public concerns about the costs of higher education, especially for those groups most affected, including parents of high school students, African-Americans, and Hispanics.

Responding to the Crisis in College Opportunity (January 2004, #04-1). This policy statement, developed by education policy experts at Lansdowne, Virginia, proposes short-term emergency measures and long-term priorities for governors and legislators to consider for funding higher education during the current lean budget years. *Responding to the Crisis* suggests that in 2004 the highest priority for state higher education budgets should be to protect college access and affordability for students and families.

With Diploma in Hand: Hispanic High School Seniors Talk About Their Future, by John Immerwahr (June 2003, #03-2). This report by Public Agenda explores some of the primary obstacles that many Hispanic students face in seeking higher education—barriers that suggest opportunities for creative public policy to improve college attendance and completion rates among Hispanics.

Purposes, Policies, Performance: Higher Education and the Fulfillment of a State's Public Agenda (February 2003, #03-1). This essay is drawn from discussions of higher education leaders and policy officials at a roundtable convened in June 2002 at New Jersey City University on the relationship between public purposes, policies, and performance of American higher education.

Measuring Up 2002: The State-by-State Report Card for Higher Education (October 2002, #02-7). This report card, which updates the inaugural edition released in 2000, grades

each state on its performance in five key areas of higher education. *Measuring Up 2002* also evaluates each state's progress in relation to its own results from 2000.

***Technical Guide Documenting Methodology, Indicators, and Data Sources for* Measuring Up 2002** (October 2002, #02-8).

State Policy and Community College–Baccalaureate Transfer, by Jane V. Wellman (July 2002, #02-6). This report recommends state policies to energize and improve higher education performance regarding transfers from community colleges to four-year institutions.

Fund for the Improvement of Postsecondary Education: The Early Years (June 2002, #02-5). The Fund for the Improvement of Postsecondary Education (FIPSE) attained remarkable success in funding innovative and enduring projects during its early years. This report, prepared by FIPSE's early program officers, describes how those results were achieved.

Losing Ground: A National Status Report on the Affordability of American Higher Education (May 2002, #02-3). This national status report documents the declining affordability of higher education for American families, and highlights public policies that support affordable higher education. It provides state-by-state summaries as well as national findings.

The Affordability of Higher Education: A Review of Recent Survey Research, by John Immerwahr (May 2002, #02-4). This review of recent surveys by Public Agenda confirms that Americans feel that rising college costs threaten to make higher education inaccessible for many people.

Coping with Recession: Public Policy, Economic Downturns, and Higher Education, by Patrick M. Callan (February 2002, #02-2). This report outlines the major policy considerations that states and institutions of higher education face during economic downturns.

Competition and Collaboration in California Higher Education, by Kathy Reeves Bracco and Patrick M. Callan (January 2002, #02-1). This report argues that the structure of California's state higher education system limits the system's capacity for collaboration.

Measuring Up 2000: The State-by-State Report Card for Higher Education (November 2000, #00-3). This first-of-its-kind report card grades each state on its performance in higher education. The report card also provides comprehensive profiles of each state and brief states-at-a-glance comparisons.

***Beneath the Surface: A Statistical Analysis of the Major Variables Associated with State Grades in* Measuring Up 2000**, by Alisa F. Cunningham and Jane V. Wellman (November 2001, #01-4). Using statistical analysis, this report explores the "drivers" that predict overall performance in *Measuring Up 2000*.

Supplementary Analysis for* Measuring Up 2000*: An Exploratory Report, by Mario Martinez (November 2001, #01-3). This supplement explores the relationships within and among the performance categories in *Measuring Up 2000*.

***Some Next Steps for States: A Follow-up to* Measuring Up 2000**, by Dennis Jones and Karen Paulson (June 2001, #01-2). This report suggests a range of actions that states can take to bridge the gap between state performance identified in *Measuring Up 2000* and the formulation of effective policy to improve performance in higher education.

***A Review of Tests Performed on the Data in* Measuring Up 2000**, by Peter Ewell (June 2001, #01-1). This review describes the statistical testing performed on the data in *Measuring Up 2000* by the National Center for Higher Education Management Systems.

***Recent State Policy Initiatives in Education: A Supplement to* Measuring Up 2000**, by Aims C. McGuinness, Jr. (December 2000, #00-6). This supplement highlights education initiatives that states have adopted since 1997–98.

***Assessing Student Learning Outcomes: A Supplement to* Measuring Up 2000**, by Peter Ewell and Paula Ries (December 2000, #00-5). This report is a national survey of state efforts to assess student learning outcomes in higher education.

***Technical Guide Documenting Methodology, Indicators and Data Sources for* Measuring Up 2000** (November 2000, #00-4).

A State-by-State Report Card on Higher Education: Prospectus (March 2000, #00-1). This document summarizes the goals of the National Center's report-card project.

Great Expectations: How the Public and Parents—White, African-American, and Hispanic—View Higher Education, by John Immerwahr with Tony Foleno (May 2000, #00-2). This report by Public Agenda finds that Americans overwhelmingly see higher education as essential for success. Survey results are also available for the following states:

Great Expectations: How Pennsylvanians View Higher Education (May 2000, #00-2b).
Great Expectations: How Floridians View Higher Education (August 2000, #00-2c).
Great Expectations: How Coloradans View Higher Education (August 2000, #00-2d).
Great Expectations: How Californians View Higher Education (August 2000, #00-2e).
Great Expectations: How New Yorkers View Higher Education (October 2000, #00-2f).
Great Expectations: How Illinois Residents View Higher Education (October 2000, #00-2h).

State Spending for Higher Education in the Next Decade: The Battle to Sustain Current Support, by Harold A. Hovey (July 1999, #99-3). This fiscal forecast of state and local spending patterns finds that the vast majority of states will face significant fiscal deficits over the next eight years, which will in turn lead to increased scrutiny of higher education in almost all states, and to curtailed spending for public higher education in many states.

South Dakota: Developing Policy-Driven Change in Higher Education, by Mario Martinez (June 1999, #99-2). This report describes the processes for change in higher education that government, business, and higher education leaders are creating and implementing in South Dakota.

Taking Responsibility: Leaders' Expectations of Higher Education, by John Immerwahr

(January 1999, #99-1). This paper reports the views of those most involved with decisionmaking about higher education, based on focus groups and a survey conducted by Public Agenda.

The Challenges and Opportunities Facing Higher Education: An Agenda for Policy Research, by Dennis Jones, Peter Ewell, and Aims McGuinness, Jr. (December 1998, #98-8). This report argues that due to substantial changes in the landscape of postsecondary education, new state-level policy frameworks must be developed and implemented.

Higher Education Governance: Balancing Institutional and Market Influences, by Richard C. Richardson, Jr., Kathy Reeves Bracco, Patrick M. Callan, and Joni E. Finney (November 1998, #98-7). This publication describes the structural relationships that affect institutional effectiveness in higher education, and argues that state policy should strive for a balance between institutional and market forces.

Federal Tuition Tax Credits and State Higher Education Policy: A Guide for State Policy Makers, by Kristin D. Conklin (December 1998, #98-6). This report examines the implications of the federal income tax provisions for students and their families, and makes recommendations for state higher education policy.

The Challenges Facing California Higher Education: A Memorandum to the Next Governor of California, by David W. Breneman (September 1998, #98-5). This memorandum argues that California should develop a new Master Plan for Higher Education.

Tidal Wave II Revisited: A Review of Earlier Enrollment Projections for California Higher Education, by Gerald C. Hayward, David W. Breneman, and Leobardo F. Estrada (September 1998, #98-4). This review finds that earlier forecasts of a surge in higher education enrollments were accurate.

Organizing for Learning: The View from the Governor's Office, by James B. Hunt Jr., chair of the National Center for Public Policy and Higher Education, and former governor of North Carolina (June 1998, #98-3). This publication is an address to the American Association for Higher Education concerning opportunity in higher education.

The Price of Admission: The Growing Importance of Higher Education, by John Immerwahr (Spring 1998, #98-2). This report is a national survey of Americans' views on higher education, conducted and reported by Public Agenda.

Concept Paper: A National Center to Address Higher Education Policy, by Patrick M. Callan (March 1998, #98-1). This concept paper describes the purposes of the National Center for Public Policy and Higher Education.

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